

Notes on some aspects of the biology of *Palaemon styliferus* Milne-Edwards from the Godavari estuarine system^{1,2}

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(With five text-figures)

Palaemon styliferus an economically important prawn of the Gautami Godavari estuary on the east coast of India, occurs in the lower regions of the estuary almost throughout the year in considerable numbers but is most common in the month of November. The food habit of the prawn is almost similar to its counterpart from the Hooghly estuary. The growth rate, however, is slightly faster in the Gautami estuary. The breeding season is restricted to a short period, generally extending from October to December.

INTRODUCTION

Only a few of the palaemonid prawns of Indian estuaries are of commercial value. *Palaemon styliferus* Milne-Edwards, is one among them and is widely distributed in the estuarine and brackish waters of India (Kemp 1917; Annandale 1922; Ganapati & Subrahmanyam 1964) and contributes to the commercial fishery in the Hooghly estuary on the east coast (Kunju 1955) and the inshore fishery at Bombay on the west coast (Rai 1933). It is also reported to be of some economic value in the backwaters of Travancore-Cochin (Menon 1954).

Apart from a detailed account of the biology of *Palaemon styliferus* given by Kunju (op. cit.) from the Hooghly estuary no subsequent observations seem to have been made on the biology of the species from other estuarine systems. The species has been recorded in the Gautami estuary, the largest of the Godavari estuarine system (Ganapati & Subrahmanyam, op. cit), but it does not form a large scale

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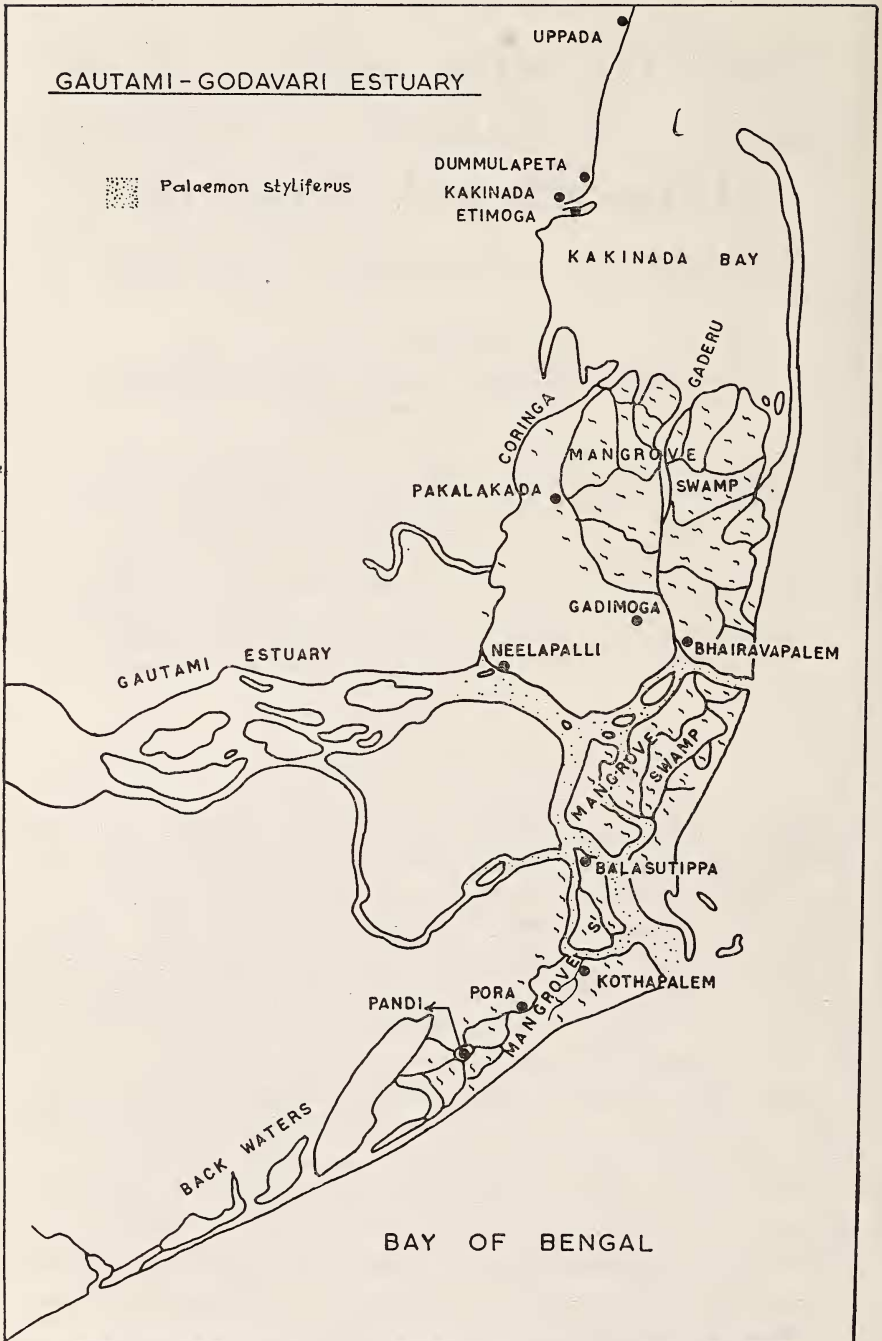


Fig. 1. Distribution of *Palaemon styliiferus* in the Gautami estuary.

commercial fishery (average 0.49% in the total prawn catch). It occurs mainly in the lower reaches of the estuary almost throughout the year (Fig. 1). It was, however, found common in the month of November. Usually it appears in the commercial catches in the estuary at the close of *Palaemon tenuipes* fishing season (July to October or early November). It is the local belief that the prawn enters the estuary in large numbers with the change in the wind direction, from south-west to north-east.

The present note is intended to comparing some of the observations on the species made by Kunju (op. cit.) from the Hooghly estuary with similar observations from the Gautami-Godavari estuary. The observations are based on the data collected during the years 1960-62 from the Gautami estuary.

MATERIALS AND METHODS

The prawn was collected mainly from the drag net catches made in the lower regions of the estuary during the periods, July 1960 to May 1961 and November 1961 to May 1962. The drag net operations were erratic during the intervening period and hence no data were maintained. All measurements were taken from the tip of the rostrum to the tip of the telson and were grouped with a 5 mm length interval.

ENVIRONMENTAL CONDITIONS

The lower tidal regions are very extensive with a net work of tidal creeks, mangrove forests and backwaters. They are characterised by warm sheltered waters with plenty of cover and muddy substratum.

The salinity in the lower regions of the estuary ranged between 0.0-34.31‰. Freshwater or slightly brackishwater conditions prevailed during the monsoon months (July-October) at the surface (average salinity 6.64‰) while the bottom waters were more saline (average salinity 19.94‰). The temperature ranged between 25.2-34.0°C.

FOOD AND FEEDING HABITS

An analysis of the contents of 16 stomachs by the frequency of occurrence method showed that organic detritus and crustaceans formed the major items of food and that the prawn appeared to be a bottom feeder by virtue of the presence of gastropod and prawn remains and sand particles (Table 1).

TABLE 1

GUT ANALYSIS OF *Palaemon styliferus*

Food items	Frequency of occurrence (%)
Organic detritus	75.01
Crustaceans (unidentified)	37.51
Sand particles	25.00
Fish remains	12.50
Penaeid prawn remains (<i>Metapenaeus</i> sp.)	12.50
Gastropod remains	6.25
Insect remains	6.25

AGE AND GROWTH

During the period of study the sizes of the prawns ranged between 16 and 120 mm. A few juveniles were available in July 1960 with a mode at 40 mm. The modal progression could be followed up to the secondary mode at 60 mm in 1960 (Fig. 2). The mode at 80 mm in

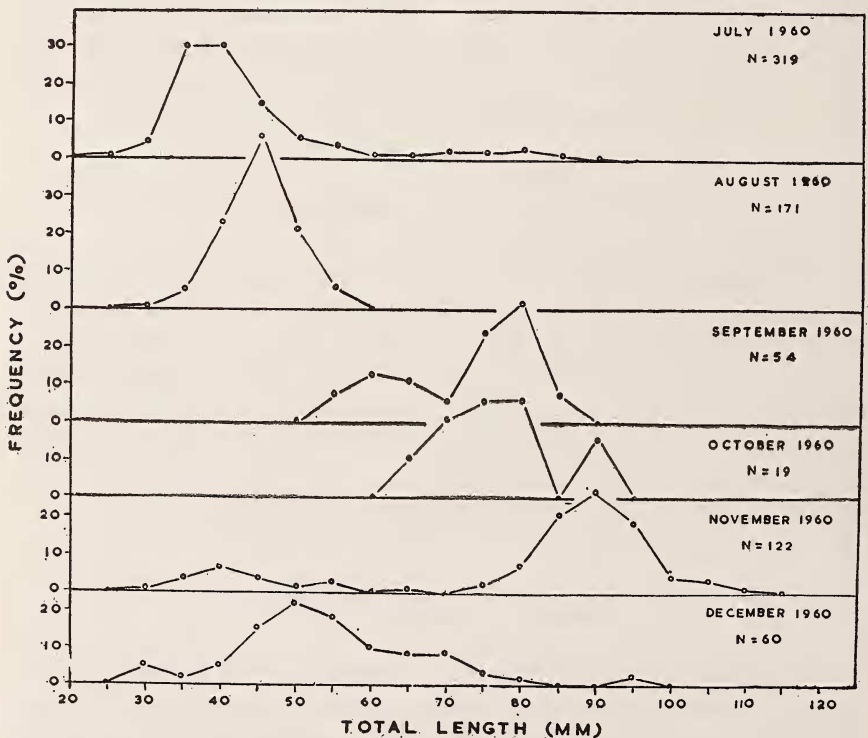


Fig. 2. Monthly size-frequency distributions of *Palaemon styliferus* from the Gautami estuary, 1960.

September 1960 shifted to 90 mm by November 1960. These progressions indicate growth rates of 10 mm/month in smaller individuals and 5 mm/month in larger individuals. In November a small mode was observed at 40 mm and the same shifted to 70 mm by March 1961 (Figs. 2-3). The average growth rate calculated from the modal pro-

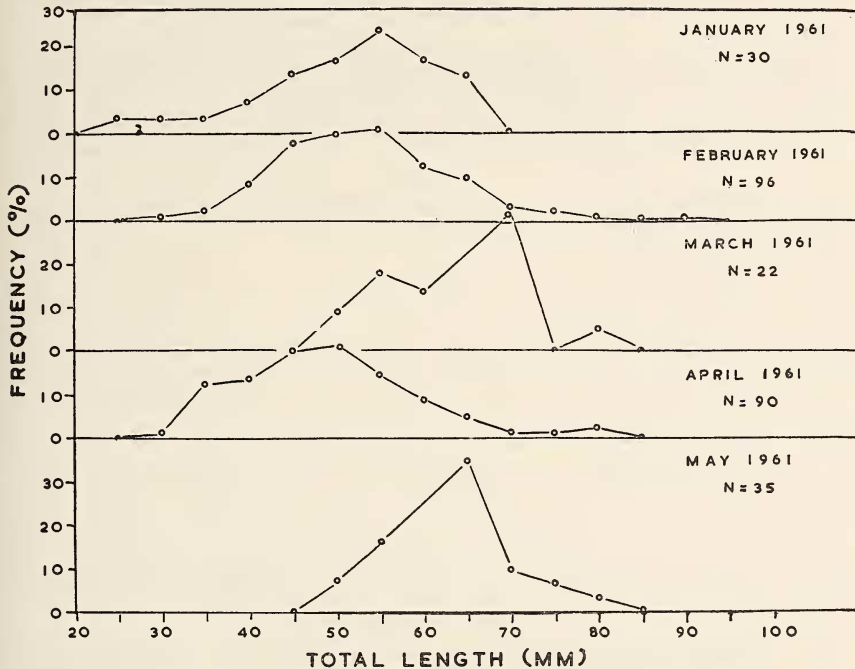


Fig. 3. Monthly size-frequency distributions of *Palaemon styliferus* from the Gautami estuary, 1961.

gression is only 7.5 mm/month. There was regression in April 1961. The size distribution in November 1961 was very much similar to the corresponding month in the previous year. Regression occurred in December and January 1962. The samples contained very few individuals during the following months (Fig. 4). The discrepancy observed in the growth rates during the two periods, from September to November 1960 and November to March 1961 is believed to be the result of continuous recruitment of juveniles during the latter period, resulting in slow progression of modes.

BREEDING BEHAVIOUR

In *Palaemon styliferus* the sexes could be separated on the basis of the presence (males) or absence (females) of appendix masculina on

the second abdominal appendage. The sex-ratio between the males and females was 1:11.4.

In palaemonid prawns, a special type of non-pinnate setae develop on the pleopods at the commencement of maturity and are concerned

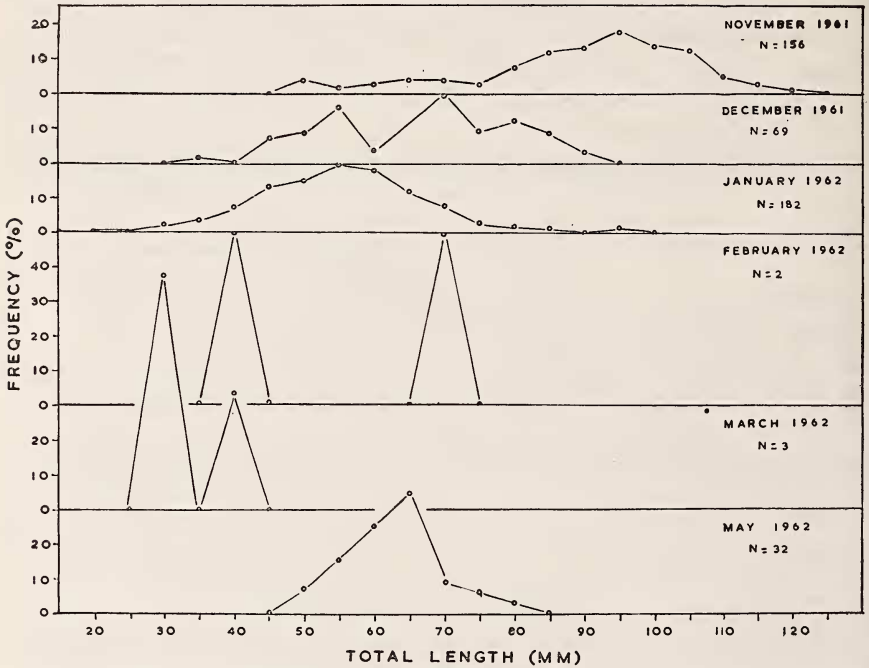


Fig. 4. Monthly size-frequency distributions of *Palaemon styliiferus* from the Gautami estuary, 1961-62.

with the egg-carriage in the brood-sac (Yonge 1955). They appear as rudiments and elongate at the time of spawning. The presence of these non-pinnate setae on the pleopods (also termed as ovigerous setae or egg-bearing setae) indicates that the prawn is mature or maturing. In *Palaemon styliiferus*, prawns measuring up to 75 mm were immature, without any trace of ovigerous setae. Rudimentary ovigerous setae were visible in specimens measuring over 75 mm. The smallest berried female measured 76 mm. These observations indicate that females spawn when they attain a minimum size of about 76 mm. The size of the majority of the mature females ranged between 76 and 95 mm. Mature individuals were available in large numbers during September-November period (62.96-84.61%) while the berried females were common during October-December period with a maximum in November. It thus appears that in the majority of the prawns maturation and spawning start in September and October respectively, reaching the maximum in November. Only juveniles were available during the subsequent months.

The majority of the berried females showed early embryonic development (78%) while those with eyed eggs in the brood (ready to hatch out) were very low in the samples (22%). The latter, however, showed fully developed ovary through the carapace indicating gonadal activity in berried condition. A few maulted specimens showed fully developed gonad, but the egg-bearing setae were rudimentary. Specimens with fully developed ovigerous setae were never observed. These observations reveal that the prawn may spawn more than once but a short time pause is likely, when the prawn moults twice, after hatching of the brood and before the next spawning, when the egg-bearing setae elongate to carry the eggs.

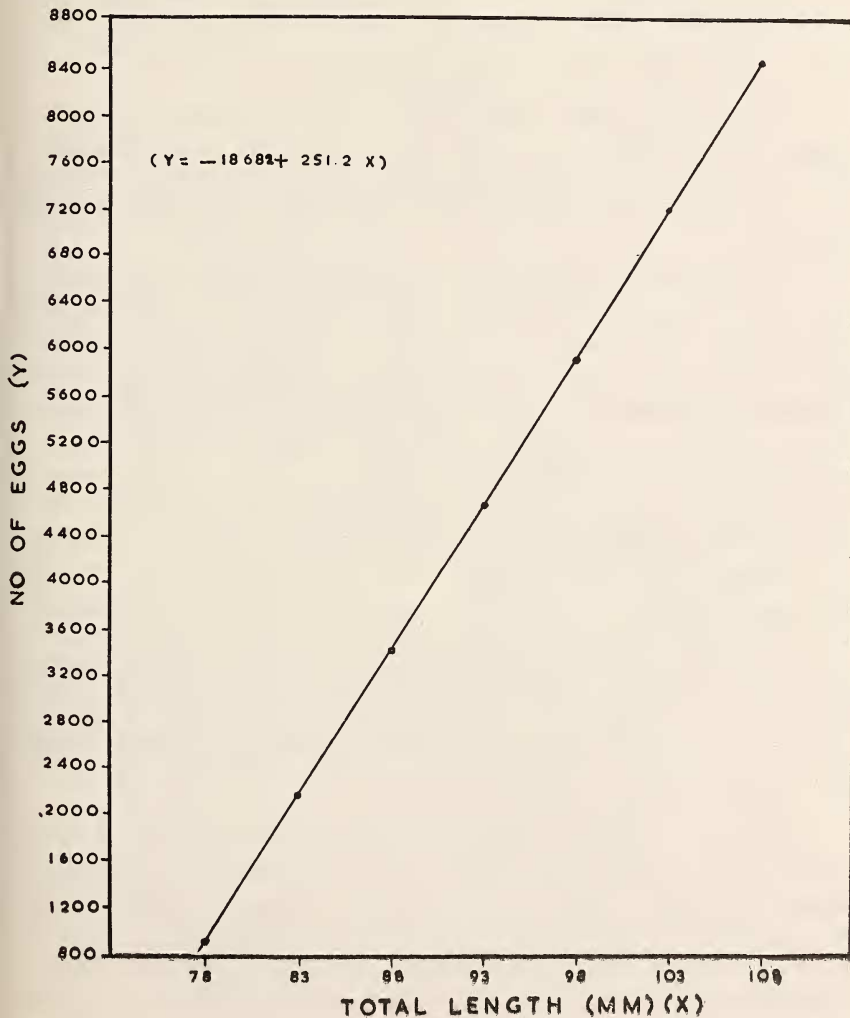


Fig. 5. Fecundity in *Palaemon styliferus*.

In 19 berried prawns, ranging between 76 and 110 mm, the number of eggs ranged between 1570 and 8640 respectively. The number of eggs in the berry showed a linear relation with the total length of the prawn (Fig. 5).

None of the prawns were parasitized.

Discussion

Palaemon styliferus is common in the Gautami-Godavary estuary in the month of November when the minimum temperature was 25.2°C and the salinity showed a rising trend after the monsoon floods. The peak fishery for this prawn in the middle zone of Hooghly estuary also coincided with minimum temperature (22.0°C) and increasing salinity (Rao 1969). The species, however, does not contribute much to the commercial fishery as in the Hooghly estuary.

The food of the prawn appears to be very much similar to its counterparts in the Hooghly estuary (Kunju loc. cit.), except for the absence of plant matter, foraminiferan shells and spicules of sponges; however, a detailed study is necessary in view of the small number of stomachs examined.

The growth rate, worked out from length frequency distribution, is estimated to range between 5 mm and 10 mm/month. On this basis, the life span of the prawn in the estuary is estimated to be about one year. By the same method Kunju (loc. cit.) and Rajyalakshmi (1964) calculated the growth rate to be 3-4 mm/month in the Hooghly estuary, which is more or less the same observed in larger individuals.

The sex-ratio is predominantly female as in the Hooghly estuary (Kunju loc. cit.). The breeding season, however, is confined to a short period in the Gautami estuary (October-December) while it is prolonged (October-July) in the Hooghly estuary (Kunju loc. cit.). Although spawning took place in the lower estuary, hatching of the brood appeared to occur only in the marine areas as no early zoeae could be recorded from the routine plankton collections. A similar condition is reported in the Hooghly estuary (Kunju loc. cit.). The prawn appears to spawn more than once during the spawning season as observed in case of the related species, *Palaemon tenuipes*, from the same estuarine system (Subrahmanyam 1971).

Although a restricted spawning period is discernible from a study of the berried females in the estuary, the size-frequency distribution indicates intermittent spawning. The juveniles encountered since November could be the progeny of the spawners of the preceding season while those encountered during the pre-monsoon months could have resulted from some spawning activity in the adjoining brackishwater or estuarine areas.

The range of berried females in the Gautami estuary is much wider than in the Hooghly estuary (68-86 mm) and the number of eggs carried by them also showed corresponding wider range. Kunju (loc. cit.) reported a number of parasitized prawns from the Hooghly estuary while none of the prawns were infested in the Gautami estuary. The reason for this is not known.

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